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October 26, 2018

Mr. Michael Mullinix
Designated Federal Official
Global Strategy and Negotiation Division
International Bureau
Federal Communications Commission
445 12th Street, S.W.
Room 6-A821
Washington, DC 20554

via e-mail

Re: ***International Bureau Seeks Comment on Recommendations Approved by World Radiocommunication Conference Advisory Committee,* IB Docket No. 16-185**

***Petition to Modify Parts 2 and 101 of the Commission's Rules to Enable Timely Deployment of Fixed Stratospheric-Based Communications Services in the 21.5-23.6, 25.25-27.5, 71-76, and 81-86 GHz Bands*, RM-11809**

Dear Mr. Mullinix:

On behalf of Elefante Group, Inc., I am responding to the question you raised yesterday during our telephonic discussion regarding possible U.S. study contributions to the upcoming WP5C meeting, focused on the two contributions submitted for consideration by Elefante Group and Lockheed Martin (in support of the technologies of Elefante Group). Scott Kotler, of Lockheed Martin, and I, representing Elefante Group, spoke with you and Danbte Ibarra, Chief of the Multilateral & Regional Affairs Branch, Global Strategy and Negotiation Division, International Bureau.

The question you posed was whether Elefante Group could implement its plans for stratospheric-based communications using the spectrum and directions set out by Facebook for high altitude platform stations ("HAPS") in Michael Tseytlin's October 22, 2018, letter filed in

IB Docket No. 16-185.[1] Those bands and directions (see the so-called "proposed compromise" on page 6 of the attachment to *Facebook's October 22 Letter*[2]) are as follows:

21.5-22.0 GHz downlink ("DL")
24.25-25.25 GHz DL
27-27.5 GHz DL
27.9-28.2 GHz DL
31.0-31.3 GHz DL

25.25-27.0 GHz uplink ("UL")
38.0-39.5 GHz UL

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1 Facebook Ex Parte Letter, *International Bureau Seeks Comment on Recommendations Approved by World Radiocommunication Conference Advisory Committee*, IB Docket No. 16-185 (Oct. 22, 2018) ("Facebook's October 22 Letter").

2 Elefante Group notes that Facebook's "proposed compromise" (the "Facebook Plan") contains no compromise or reconciliation at all between Facebook's View A and Lockheed Martin's View C submitted to the Commission's World Radiocommunication Conference Advisory Council. Elefante Group, joined by Lockheed Martin, supported View C in comments filed in this docket on October 17. *See* Joint Comments of Elefante Group, Inc. and Lockheed Martin Corporation, Supporting the Technologies of Elefante Group, Inc., on the Views Regarding Agenda Item 1.14, IB Docket No. 16-185 (Oct. 17, 2018). As Elefante Group and Lockheed Martin explained, they did not oppose the elements of the Facebook Plan as part of a comprehensive package of bands and directions for HAPS, as Views A and C were largely complementary. However, lest the Commission conclude that the Facebook Plan represents any sort of compromise with View C, Elefante Group underscores that the Facebook Plan differs in almost every respect from the bands and directions in View C. More critically, from Elefante Group's perspective, the Facebook Plan, as detailed herein, while perhaps suitable for a limited conception of HAPS, lacks the elements of a spectrum plan that would allow operators to implement a high-capacity stratospheric-based communications solution, such as that envisioned by Elefante Group to implement a stratospheric-based communications service ("SBCS") (the sole exception being downlink spectrum in 27-27.5 GHz). In order to fully implement Elefante Group's vision for SBCS, complementary spectrum in addition to that addressed in View C would be required, as Elefante Group detailed in its Petition for Rulemaking pending in RM-11809. *Petition to Modify Parts 2 and 101 of the Commission's Rules to Enable Timely Deployment of Fixed Stratospheric-Based Communications Services in the 21.5-23.6, 25.25- 27.5, 71-76, and 81-86 GHz Bands*, Petition for Rulemaking, RM-11809 (May 31, 2018)("Petition").

Background

Before addressing that question, some background may be helpful. Facebook – which acknowledges in its *October 22 Letter* that it has no plans to be a HAPS manufacturer or an operator – outlines a limited vision for HAPS and the United States position on Agenda Item 1.14: "one potential way to connect people in rural areas who do not have broadband."[3] Facebook, which states it has invested in HAPS technology, effectively sees HAPS as an add-on, suggesting it "can be used by both mobile and satellite operators to provide more affordable broadband."[4] The frequency bands and directions espoused by Facebook stem from its conception of HAPS as a rural broadband solution.

Elefante Group, supported by Lockheed Martin on the technologies, will be an airship and communications payload manufacturer and a wholesale operator of stratospheric-based communications service ("SBCS").[5] Elefante Group has a much broader and future-oriented vision for stratospheric solutions than Facebook and most, if not all, other HAPS proponents. Elefante Group's SBCS implementation will be a way to accelerate deployment of 4G, 5G, and next-generation network technologies that will follow 5G in urban and rural areas. Elefante Group platforms will carry networking capability that will minimize latency to <5 ms. Elefante Group aims to provide, at the outset, consumer and enterprise user terminal capacity of 1 Tbps in each direction within each airship's coverage area of up to 15,400 square kilometers. Elefante Group's SBCS will support 4G/5G/XG backhaul and enterprise WAN, as well as residential and business broadband service. Elefante Group's airships will also be able to carry sensor payloads to augment its communications capabilities to deliver unique IoT solutions. Elefante Group will enable network densification, accelerate deployment of next-generation services to "urban deserts," and enable rural areas to more rapidly and cost-effectively receive next-generation services. The Elefante Group SBCS implementation will bring distinct advantages and deliver essential complements to mobile carrier rollout and satellite coverage. As a wholesale operator, Elefante Group will leverage scale to do far more than any mobile carrier or satellite provider could achieve by deploying HAPS to bring broadband connectivity to rural areas.

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3 *Facebook's October 22 Letter* at 1.

4 *Id.*

5 Tens of millions of dollars have been and continue to be invested in Elefante Group's design and development of airships and communications platforms leading toward SBCS systems manufacturing and operation, building upon considerably larger program and technology investments that Lockheed Martin has worked on and made in recent years. Even more significant technology investment and construction costs will be incurred by Elefante Group before it begins to deploy SBCS commercially.

SKY Perfect JSAT Corporation ("JSAT"), in a recent *ex parte* letter filed in RM-11809, concurs in Elefante Group's assessment of what makes SBCS distinct.[6] JSAT noted that "SBCS would be an ideal solution for 5G back haul in Japan and elsewhere" and goes on to highlight key advantages of SBCS. It explains that "JSAT has studied various methods by which small cell densification in urban areas can be achieved, and firmly believes that SBCS has a key role to play in achieving this important objective. Further, the ability to upgrade an entire large metro area with the switch-over from one or a small number of platforms to their substitutes will enable stratospheric-based solutions to remain state of the art more readily than terrestrial backbone networks."[7] JSAT, after conducting technical due diligence, concluded that the "Elefante/Lockheed Martin approach clearly holds the most feasible and capable promise for realizing a viable platform fleet equipped with advanced communications payloads, including networking capabilities, in the next few years to realize high-capacity, low-latency SBCS services, JSAT is of the view that such services that the Elefante solution will be able to provide will be important for the achievement of next generation networks in an efficient manner."[8]

Elefante Group submits that the United States should take a leadership position based on a broad vision of what stratospheric communications can be and adopt a national proposal under Agenda Item 1.14 that is more comprehensive: encompassing both the HAPS rural broadband deployments suggested by *Facebook's October 22 Letter,* and consistent with the vision for SBCS put forth by Elefante Group. This can be accomplished by a complementary melding of View A and View C, as described in the comments of Elefante Group and Lockheed Martin filed on October 17 in Docket No. 16-185.

One final preliminary note is in order, which complements our discussion yesterday. Elefante Group filed its *Petition* (pending in RM-11809) seeking SBCS rules that would facilitate multiple types of stratospheric-based communications systems, including the SBCS of Elefante Group (which is not HAPS) and many of HAPS systems that are currently being considered. Separately, to help foster a greater variety of HAPS systems in the United States and elsewhere in Region 2, Elefante Group and Lockheed Martin have been involved in the United States' preparatory process for Working Party 5C on Agenda Item 1.14 ("AI 1.14"). Lockheed Martin submitted View C to the WAC and Elefante Group and Lockheed Martin jointly filed supporting comments on October 17 in support of View C and the use of and espousing reconciliation with the other views received on AI 1.14 to the extent possible. This includes Facebook's View A, which is complementary as to the directions described in View C in the

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6 *See* Letter of Koki Koyama, Board Director, Senior Managing Executive Officer, and Unit President, Space Business Unit, SKY Perfect JSAT Corporation, to Marlene Dortch, Secretary, Federal Communications Commission, filed in GN Docket No. 14-177 and RM-11809 (October 19, 2018).

7 *Id.* at 1.

8 *Id.* at 2.

21.5-22.0 and 25.25-27.5 GHz bands. Lest there be any doubt, however, the spectrum and directions in View C, while consistent with the *Petition*, would not, standing alone, support Elefante Group's vision for SBCS. That will require augmenting the View C frequencies with additional spectrum for user terminals (in the uplink direction) in the range 22.0-23.6 GHz and for gateways in 71-76 and 81-86 GHz, as set forth more fully in the *Petition*.

Response

Responding to your specific question, with the foregoing in mind, the following are some of the principal reasons why the Facebook Plan would not support the implementation of a system such as Elefante Group's SBCS in the United States that would deliver high-capacity, low-latency solutions to urban as well as rural areas:[9]

1. The bands in the Facebook Plan are asymmetric in layout and bandwidth. HAPS, as envisioned by *Facebook's October 22 Letter*, suggests a target market of rural residential broadband, which is characterized by asymmetric throughput capabilities. The very different amalgamations of UL and DL spectrum in the Plan do not support full duplex throughput, which Elefante Group plans to provide given its target markets for enterprise and 4G/5G/XG backhaul.
2. 25.25-27.0 GHz is insufficient spectrum to achieve the 1 Tbps UL capacity per platform that is necessary to serve the Elefante Group target markets described above. 38-39.5 GHz is even less UL spectrum. Because these two UL bands would be separated by 11 gigahertz, use of the two would require two antenna apertures, materially increasing the cost, size, weight, and requirements for power and propulsion of the airship, and requiring larger and more costly ground stations, all of which will increase the costs of service to end user customers.
3. Achieving 1 Tbps under the Facebook Plan would be challenging in DL direction because of the piecemeal nature of the spectrum. The many small DL pieces in the Facebook Plan would preclude the use of 450 megahertz channels necessary for efficiently providing the high throughput required for enterprise/backhaul services. Even the 500 megahertz sub-bands (*e.g.*, 21.5-22.0, 27-27.5 GHz) might not support 450 megahertz channels because of guard band requirements that will aid compatibility with

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9 The Commission retains the flexibility, of course, to implement a framework for SBCS regardless of the ultimate decisions made at WRC-19 regarding AI 1.14, consistent with any cross-border obligations. Nonetheless, a United States position at the upcoming CITEL PCC.II meeting that includes the bands and directions in View C will facilitate a greater variety of stratospheric solutions domestically as well as in other Region 2 countries. (As noted earlier, realization of Elefante Group's vision for SBCS will require access to spectrum on a shared basis in addition to that which is the subject of View C.)

adjacent bands. The 28 and 31 GHz band pieces (300 megahertz each) could only support channels of approximately 220-250 megahertz each, and thus would not fit well as available colors in a scheme seeking to serve enterprise customer and carrier backhaul use cases. The shared nature of the HAPS spectrum requires the ability to flexibly use spectrum resources to achieve capacity targets and thus a consistent size of colors throughout the implementation, *e.g.*, 450 megahertz colors throughout. The piecemeal sub-bands of the Facebook Plan make this virtually impossible. The smallest sub-band incorporated into multi-band designs would limit the maximum rates to and from user terminals, in this case lower than Elefante Group's anticipated market needs, as well as introduce a downward influence on the total capacity. Piecemeal bands would also have materially adverse impacts to SWaP (size, weight, and power) trades for SBCS airships, a matter Elefante Group and Lockheed Martin have studied extensively.

4. The >5 gigahertz separation between the 24.25 and 31.3 GHz bands could force use of a second antenna aperture on the platform for the DL, with similar significant impacts as described in item 2 above regarding airship cost, size, weight, and power and propulsion systems, as well as size and cost of ground stations, leading to increased service costs for ultimate end users, both consumers and businesses.
5. The piecemeal DL bands of the Facebook Plan would complicate the communication payload requirements significantly and they unquestionably represent less spectrum than the sum of their parts due to guard band requirements at the edge of each non-contiguous sub-band.
6. 24.25-25.25 GHz (700 megahertz of it) is Upper Microwave Flexible Use Services ("UMFUS"), in the United States; compatibility in the same or overlapping geographic areas is challenging at a minimum; Facebook avoids the issue of mobile and stratospheric compatibility through extreme mitigation: complete geographic separation (urban and rural).
7. There are emerging uses of the 24.45-24.65 GHz band for drone radionavigation, in which case the putative 24.25-25.25 GHz DL band may effectively be broken into discontinuous 200 megahertz and 600 megahertz sub-bands, leaving the questions of UMFUS compatibility just described aside.
8. 27.9-28.2 GHz is UMFUS in the United States; compatibility would be challenging at a minimum.
9. 31.0-31.3 GHz is Local Multipoint Distribution Service in the United States; compatibility may be possible as long as this remains a fixed service based on Elefante Group/Lockheed Martin studies of fixed service compatibility in other bands.
10. 31.0-31.3 GHz is adjacent to the 31.3-31.8 GHz Radio Astronomy Service ("RAS") band, representing a potential compatibility issue if the entire 300 megahertz of 31.0-31.3 GHz were used for HAPS (Elefante Group/Lockheed Martin have not specifically studied

compatibility in this case and are aware that the latest WP 5C Chairman's Report appends two studies that suggest compatibility may be possible under some HAPS system configurations.)

11. 38-39.5 GHz is UMFUS in the United States; compatibility would be challenging at a minimum.
12. DL in 24.25-25.25 GHz band would create greater compatibility issues with RAS in 23.6-24.0 GHz than DL in 25.25-27.5 GHz band because of proximity of the bands.

Conclusion

For the foregoing reasons, and as set out more fully in the joint comments of Elefante Group and Lockheed Martin submitted on October 17 in Docket No. 16-185, Elefante Group supports the adoption of a United States position on Agenda Item 1.14 that involves a true melding of Views A and C.

Please let me know if you have additional questions. We are happy to discuss any of the foregoing in greater detail.

A copy of this letter is being submitted to the Secretary's Office for inclusion in the above-referenced docket and rulemaking file as required by the Commission's Rules.[10]

Respectfully submitted,

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Attorney for Elefante Group, Inc.

cc: Marlene Dortch, Secretary
Dante Ibarra, Chief, Multilateral & Regional Affairs Branch, Global Strategy and Negotiation Division, International Bureau
Rachel Bender, Advisor to Chairman Pai
Will Adams, Advisor to Commissioner Carr
Umair Javed, Advisor to Commissioner Jessica Rosenworcel
Thomas Sullivan, Chief, International Bureau

[10] 47 C.F.R. § 1.1206(b).